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ABSTRACT

This study was designed to test the null hypothesis which states that there will be no significant difference in mean creativity scores on the verbal or figural subtests of the Torrance Tests of Creative Thinking among subjects with no creativity training, those with creativity training under traditional, and those with creativity training under cooperative learning structures, either immediately after training, 2 months after training, or on both occasions. Subjects were 159 fifth-grade students from 8 classrooms in a small city in Mississippi. Of the 159 students, 40 students were in a control group receiving no training, 60 were in the traditional group, and 59 were in the cooperative learning group. Creativity training lasting 50 minutes a day for 10 days was presented to the 2 treatment groups. The cooperative learning structure used was Student Team Achievement Divisions. The Torrance Tests of Creative Thinking were administered immediately after the training sessions and again after 60 days. It appeared that in the short run the traditional classroom is a more effective classroom structure with which to hold such a training workshop for children, but, in the long run, results become less clear. (Contains 35 references.) (JDD)

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CREATIVITY ENHANCEMENT AS A FUNCTION OF CLASSROOM STRUCTURE: COOPERATIVE LEARNING VS. THE TRADITIONAL CLASSROOM

by

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Cooperative learning is being successfully used in schools in the more traditional subjects such as reading, math, social studies, etc. Research (Johnson & Johnson, 1987; Slavin, 1987, 1988; Johnson, Maruyama et al., 1981) have shown positive results not only in acievement but in such concomitant areas as conflict resolution, peer support, encouragement, and feedback, appreciation of civersity (cultural, racial, physical, etc.), and motivation. The Johnsons (1987) also observed that children working cooperatively appear to have greater skills in critical thinking. Positive self-esteem and a positive view of what the future will hold allows those children working cooperatively to indulge in academic risk-taking. This was corroberated in the study conducted by Sharan, Ackerman, and Hertz-Lazarowitz (1980). They showed the effectiveness of cooperative learning. The average ES across grades 2 through 6 of those considered being at a higher cognitive level was 0.43 and 0.10 for those who were considered at a low cognitive level. In addition, responses to questions involving higher level thinking were analyzed. It was demonstrated that fifth-grade students learning subject matter in a cooperative learning structure used longer answers and illustrated

those answers even though no illustrations were required. Those traditionally taught fifth-grade students learning the same material and responding to the same questions responded with no illustrations. The investigators characterized the responses of the students taught in small group structure as being more fluent and more elaborative than those of the more traditionally taught students. It was concluded that children in a small-group structure not only learn more efficiently but also are involved at a higher level of thinking in their work.

Studies (Johnson & Johnson, 1987) have shown that the environment is open, interaction between group members is positive and nonthreatening, heterogeneous groups effectively open the group to new and different ways of approaching the task of creativity, and that divergent thinking is a result of the group process. Studies have shown that not only do students become friendlier and more open with one another, but they have also demonstrated higher scholastic achievement and self-esteem when the principles of cooperative learning have been used to structure the classroom for traditional subject matter. Johnson and Johnson (1987) noted that "Whenever problem solving is desired,

whenever divergent thinking or creativity is desired . . . cooperative learning should be used" (p. 44).

Business and industry utilizes the group approach in their quest for creativity, thus defining the parameters in which creativity flourishes. Whiting (1987) notes that within the corporate world using groups to take on problems does have its advantages. The needs of various elements within the corporate structure can be met and, second, the diverse backgrounds of such individuals add another dimension to the process inasmuch as new and diverse ideas may be forthcoming. Corporate employees interviewed by Solomon (1990) gave high praise to the team approach, especially by those in charge of creativity and creative problem solving training.

Until now, no investigation has been done as to the effect of classroom environment as established by structural differences on the enhancement of creativity. This lack of empirical information was confirmed by the Cooperative Learning Center, University of Minnesota (personal communication, February 21, 1992) and by Dr. Robert Slavin (personal communication, February 26, 1992).

Adams (1986) stated that groups can bring to the creative process "many diverse perceptions and

intellectual specialities to bear on a problem" (p. 131). Also, Davidson and O'Leary (1990) stated that:

> cooperative learning shows the power of divergent thinking and learning. When teachers release some of their control over learning situations and share the responsibility with students, a dramatic release of creative potential can occur for both. (p. 33).

Guilford (1977), however, asserted that there are many pitfalls to group thinking. These may include domination of the group or, conversly, withdrawal from the group by any of its members. Also, Torrance (1981a) observed the behavior of highly creative children in groups as showing little cooperation, motivation, goal orientation or identification with the rest of the group in Grades 2 through 4, but by Grades 5 and 6, these individuals were taking on more of a leadership role.

This study was designed to explore the differences in creativity of children given creativity enhancement in the traditional, more individualistic manner and in cooperative teams. The results of such an exploration could affect not only the teaching of creativity in the classroom but the teaching of other nontraditional subject matter. If children could be taught cooperation and collaboration early on, this might affect the way they function within groups in the future and may offer an alternative to working alone for success.

Hypotheses

The research was designed to test the null hypotheses which states that there will be no significant difference in mean creativity scores on the verbal or figural subtests of the Torrance Tests of Creative Thinking among subjects with no creativity training, those with creativity training under traditional, and those trained under cooperative learning structure, either immediately after training, 2 months after training, or on both occasions.

Based on the literature reviewed, there was the expectation that children trained in the cooperative learning setting were expected to score significantly higher than those in the traditional structure group.

METHOD

Research Design

The experiment involved 159 subjects from eight self-contained fifth-grade classrooms from two schools within the same school district in a small city in Mississippi. The classes were divided so that two received no training and were designated the control group, three were assigned to the traditional group and three to the cooperative learning group. This assignment was done randomly, subject to the constraint that at least one class in each school was represented

in each group. The results of two separate testing sessions using the Torrance Tests ofCreative Thinking constituted the dependent variable. The first testing session occurred immediately after the 2-week training session, the second 60 days later.

In this was a quasi-experiment (Campbell & Stanley, 1963; Cook & Campbell, 1979), the groups were preestablished, self-contained classes, and were as similar as possible given the circumstances. Normally, this design would have been treated using a hierarchical analysis method, but it was assumed that the novelty of the skills being taught would overcome any lack of independence in responses that might accrue from using intact classes. Therefore, the experimental design was a nonequivalent control group design (Campbell & Stanley, 1963; Cook & Campbell, 1979) with the dependent measure being repeated after a delay. The use of a delayed posttest was in keeping with Campbell and Stanley's (1963) admonition that the evaluation of teaching methods should not be totally dependent upon immediate posttests or measures at any one point in time. Campbell and Stanley (1963) recommended that posttests be repeated after a period of time has elapsed.

Although the training for all six classes was the same, the structure in which the training occurred differed. Classes were assigned randomly to each group so that there were three traditional structure classes, three cooperative learning structure classes, and two control classes (see Table 1). This random assignment was conditional in that at least one class in each school was represented in each training condition. Threats to internal validity which are especially true of quasi-experiments, such as those described by Cook and Campbell (1979), were minimal since these were totally self-contained classes which would be receiving the same training in creativity.

Measuring Instruments

Team assignments and level of creativity (specifically, originality) were determined by using the Onomatopoeia and Images, Form Ia, a subtest of the Thinking Creatively with Sounds and Words (Torrance et al., 1973a). This test measures responses based on "the principle of statistical infrequency and relevance" (Khatena, 1982, p. 82) and is scored from 0 to 4 points per response with 0 being the most frequent response (being given 5% of the time or more often) and 4 being the least frequent response (1% or less frequently given) (Khatena & Torrance, 1973). Teams

TABLE 1

DESCRIPTIVE STATISTICS BY GROUP

	Control	Traditional	Cooperative Learning
Class (Table 1)	A1, B1	A2, A3, B2	A4, B3, B4
Number	40	60	59
% Black	83	68	90
% Male	48	55	59
% Free/reduced lunch	78	50	86
Average scores-complete battery[a]	46.1	46.6	35.4
Average O & I scores	21.9	21.6	23.0

Note: [a] Two scores unavailable in control group; two scores unavailable in traditional group; one score unavailable in cooperative learning group

were formed within each class in the experimental group based on the methods suggested by Slavin (1988) (see Table 2). Assignment to teams was dependent upon ranking of scores obtained on O & I within the classroom. Teams were adjusted to reflect the racial and gender makeup of the classes as Slavin (1988) has suggested (see Table 3).

The Torrance Tests of Creative Thinking (TTCT) (Torrance, 1990a, 1990b) was used as the dependent measure. This test has been used traditionally to measure creative thinking abilities in both the verbal and figural dimensions (e.g., Engelman, 1978, 1981; Sikka, 1991; Torrance, 1972; Torrance, 1981a). For this study, Form A of both the figural and verbal subtests was used for the initial testing, and Form B for the delayed testing. The test-retest reliabilities for subtest scores on alternate forms of the figural test range from .60 to .85 and from .61 to .93 for the verbal subtests. Also an interrscorer reliability correlation coefficient for the figural and verbal subtests of Forms A and B of the TTCT. These correlation coefficients were based on the comparison between scores obtained by the individual raters and the experimenter on 20 cases of each, the figural and verbal tests of Form A and Form B (see Table 4).

TABLE 2

METHOD OF TEAM ASSIGNMENT

	Rank Order	Team Name
High Performing Students	1	A
	2	B
	3	C
	4	D
	5	E
	6	F
	7	F
	8	E
	9	D
	10	C
	11	B
	12	A
Average Performing Students	13	
	14	
	15	A
	16	B
	17	C
	18	D
	19	E
	20	F
Low Performing Students	21	F
	22	E
	23	D
	24	C
	25	B
	26	A

Nos. 13 and 14 were placed at random to make 5-person teams

TABLE 3

DESCRIPTION OF COOPERATIVE LEARNING TEAMS

Team	Number	% Black	% Male	% Free/ reduced lunch	Achievement scores- complete battery	Average O & I Score
1	3	100	67	100	36.1	15.7
2	3	100	33	100	40.9	15.3
3	3	100	67	100	45.9[a]	15.3
4	3	100	33	67	31.6	15.3
5	3	67	67	67	34.3	28.3
6	4	75	50	100	34.1	22.5
7	4	75	50	75	43.0	23.5
8	4	100	75	75	47.6	23.0
9	3	67	67	100	31.8	24.7
10	3	100	67	100	35.9	24.7
11	3	66	33	66	31.9	21.3
12	4	100	50	100	42.5[a]	23.8
13	4	100	75	100	35.6	25.5
14	3	100	67	100	29.0	25.3
15	5	100	60	80	25.3	27.8
16	4	75	50	75	27.9	28.3
17	3	100	100	67	39.2	25.0

Note: [a]Achievement score unavailable for one member of team.

TABLE 4

INTERSCORER RELIABILITY

Pearson-Product Moment Correlations of Scores Assigned by Independent Raters on 20 Cases of the Torrance Tests of Creative Thinking

	Form A	Form B
Verbal:		
Fluency	.89	.94
Flexibility	.87	.90
Originality	.61	.86
Figural:		
Fluency	.82	.73
Originality	.73	.69
Abstractness of Title	.95	.92
Elaboration	.81	.92
Resistance to Closure	.91	.72

Materials

Special materials and activities were created based on the work of Khatena (1979, 1981, 1984), Torrance (1979), and others. The Osborn-Parnes model, which has been so successful in the past (Torrance, 1972), was used as the basis for the training activities. This method is compatible with cooperative learning since the children are actively involved as opposed to the more tutorial nature of other methods of creativity training.

Procedures

Intact classes were randomly assigned to the control group and to either the traditional or cooperative learning group, conditional on the fact that at least one class in each school would be in the control group and one in each structure condition. One week prior to the workshop, the O & I was administered to all classes and scored. Team membership was established based on rank order with reference to originality (see Table 2). Adjustments were made in team membership in order to reflect the racial, gender, and socioeconomic makeup of the class, as suggested by Slavin (1988).

In order to preclude the possibility of time of day becoming a confounding factor, schedules for the

workshop were set by school and changed during the second week.

The workshop (see Appendix D) consisted of 10 periods lasting 50 min each. Slavin (1988) commented that a study of cooperative learning which lasts less than 2 weeks, or 10 hours, does not constitute a true field experiment of the cooperative learning structure. He noted that anything less than the 2-week length would be artificial and not typical of most school tasks. What would be tested would amount to alternating group work and individual efforts with little effect of either. Testing, or interviewing, should be done only after the group has had an appropriate amount of experience as a group. Khatena and Dickerson (1973) found statistically significant effects of training after giving sixth-grade children instruction for 360 minutes over a period of 9 days.

The cooperative learning structure followed the format described by Slavin (1987, 1988) and called STAD or Student Team Achievement Divisions. The format of this method appeared to be most compatible with the traditional structure inasmuch as there was some direct teacher input in the form of instructions and explanations of goals in addition to the actual performing of the tasks either individually (in case of

the traditional group) or as a team (in case of the cooperative learning group).

Form A, both verbal and figural, of the TTCT was given at the completion of the 2-week unit, and Form B after a 60 day waiting period. These tests were administered to all eight classes. The Directions Manual (Torrance, 1990b), was closely adhered to.

Statistics

Means and standard deviations were computed for all verbal and figural subtests of both Forms A and B of the TTCT based on groups and originality levels, in addition to ES for groups and originality levels. Interpretations of the differences for ES were tied to the levels suggested by Cohen (1977). A small effect size would be 0.20, a medium one 0.50, and a large effect size 0.80. These values were judged compatible with those studies from the literature using effect size as a means of explaining results.

The statistical design was a multivariate block design with repeated measures. Because of the novel tasks involved in the training, the subjects were assumed to be acting independently, therefore a hierarchical design reflecting the intact classes was not used. The eight TTCT subtest scores (three for the verbal subtest and five for the figural subtest)

represent the multivariate dimension and the two test occasions (immediate and 60-day delayed posttest) represented the repeated measures dimension. The level of originality, as measured by the O & I, was the blocking variable, and the training conditions (traditional, cooperative learning, and control) represented the remaining independent variable. The level of significance was set at the .05 level.

The ESs were computed using a Hewlett-Packard HP-15C programmable scientific calculator. The SPSS-PC+ statistical package (Norusis, 1990) was used to analyze all other data.

Results

Torrance and Ball (1984) used 100 as the mean standard score with a standard deviation of ±20 for both forms of the Torrance Tests of Creative Thinking. On the immediate posttest (Form A) (see Table 5), the mean score on all verbal subtests was within the average range, but below the mean. On the figural subtests, the subjects scored above the mean (106.04) on the fluency subtest, at the mean (100.16) on the abstractness of title subtest, and slightly below the mean on the originality and elaboration subtests. On the resistance to closure subtest, the subjects had a mean of 74.40, more than one standard deviation below the mean. On the

TABLE 5

MEANS AND STANDARD DEVIATIONS
OF IMMEDIATE POSTTESTS
FORM A, TTCT

	Verbal			Figural					
	Flu	Flex	Orign	Flu	Orign	Abs T	Elab	ResCl	N
Total									
M	86.50	81.01	89.32	106.04	98.59	100.16	90.57	74.40	(159)
SD	(21.92)	(18.45)	(19.71)	(20.86)	(18.02)	(26.67)	(18.52)	(27.22)	
By Treatment:									
Non-treatment									
M	77.43	73.75	78.58	105.55	97.53	96.25	80.23	75.50	(40)
SD	(25.14)	(23.37)	(20.85)	(19.44)	(15.95)	(34.93)	(11.09)	(29.24)	
Treatment									
M	89.55	83.45	92.93	106.21	98.94	101.47	94.04	74.03	(119)
SD	(19.93)	(15.86)	(17.00)	(21.39)	(18.71)	(23.29)	(19.24)	(26.63)	
By Group:									
Control									
M	77.43	73.75	78.58	105.55	97.53	96.25	80.23	75.50	(40)
SD	(25.14)	(23.37)	(20.85)	(19.44)	(15.95)	(34.93)	(11.09)	(29.24)	
Traditional									
M	93.45	85.77	95.72	107.83	100.00	98.50	87.48	74.58	(60)
SD	(22.24)	(17.00)	(18.79)	(22.24)	(19.79)	(25.16)	(18.00)	(24.45)	
Cooperative									
M	85.59	81.08	90.10	105.32	97.86	104.49	100.00	73.47	(59)
SD	(16.53)	(14.36)	(16.85)	(20.64)	(17.64)	(21.00)	(18.28)	(28.88)	

Note: Flu = Fluency; Flex = Flexibility; Orig = Originiality; Elab = Elaboration; AbsT = Abstractness of Title; ResCl = Resistance to Premature Closure

delayed posttest (Form B) (see Table 6), the subjects obtained mean scores more than one standard deviation below the mean (74.71 on the fluency subtest, 70.90 on flexibility, and 78.72 on the originality subtests). On the figural subtests, means on all subtests were within the average range but below the mean score of 100. These ranged from a low of 80.61 on the figural elaboration subtest to 97.65 on the figural fluency subtest.

The hypothesis stated that there would be no statistically significant difference in mean TTCT subtest scores among groups--traditional, cooperative, and control--on the immediate posttest (Form A), delayed posttest (Form B), or both. It was tested using first a multivariate analysis of variance in which group and originality level were treated as between subject factors, time (immediate vs. delayed posttest) was treated as a within-subjects factor, and the eight TTCT subtest scores were the dependent variables.

Significance Tests

Group membership was a statistically significant ($p < .05$) main effect on the TTCT when looking at both forms together ($F(16, 282) = 3.496$, $p = .000$) (see Table 10). Time itself was a statistically significant factor (see Table 7) ($F(8, 140) = 19.871$, $p = .000$) and when

TABLE 6

MEANS AND STANDARD DEVIATIONS
OF DELAYED POSTTEST
FORM B, TTCT

	Verbal			Figural					
	Flu	Flex	Orign	Flu	Orign	Abs T	Elab	ResCl	N
Total									
M	74.71	70.90	78.72	97.65	94.20	91.22	80.61	83.14	(159)
SD	(24.66)	(20.05)	(22.95)	(15.90)	(17.48)	(24.64)	(13.83)	(27.47)	
By Treatment									
Non-treatment									
M	69.60	64.25	72.73	99.78	97.88	87.93	76.18	82.14	(119)
SD	(24.30)	(21.00)	(24.65)	(17.53)	(20.30)	(30.44)	(13.57)	(27.62)	
Treatment									
M	76.44	73.13	80.74	96.94	92.97	92.34	82.10	83.36	(119)
SD	(20.52)	(19.29)	(22.09)	(15.32)	(16.33)	(22.40)	(13.65)	(27.53)	
By Group									
Control									
M	69.60	64.25	72.73	99.78	97.88	87.93	76.18	82.48	(40)
SD	(24.30)	(21.00)	(24.65)	(17.53)	(20.30)	(30.44)	(13.57)	(27.62)	
Traditional									
M	73.72	72.22	76.72	97.17	96.13	94.07	84.58	75.58	(60)
SD	(18.85)	(18.07)	(19.95)	(13.80)	(15.58)	(21.21)	(15.41)	(30.70)	
Cooperative									
M	79.20	74.07	84.83	96.71	89.75	90.58	79.58	91.27	(59)
SD	(21.90)	(20.58)	(23.54)	(16.85)	(16.58)	(23.60)	(11.18)	(21.39)	

Note: Flu = Fluency; Flex = Flexibility; Orig = Originality; Elab = Elaboration; Abs T = Abstractness of Title; ResCl = Resistance to Premature Closure

282) = 5.054, p = .000) (see Table 8), and after a delay of 60 days (Form B) (F(16, 282) = 4.567, p = .000) (see Table 12). Therefore, univariate comparisons were run to identify specific subtests on which statistically significant group differences existed. Any significant univariate tests were followed by the Scheffé post hoc procedure.

For the univariate comparisons of the subtests by group,significant results ($p < .05$) on Form A (immediate posttest) were obtained on verbal fluency (F(2, 147) = 7.42, p = .00), flexibility (F(2, 147) = 5.42, p = .01), originality (F(2, 147) = 11.00, p = .00), and figural elaboration (F(2, 147) = 19.68, p = .00) (see Table 10). On form B, the delayed posttest, statistically significant subtests ($p < .05$) were found on verbal flexibility (F(2, 147) = 3.67, p = .03), originality (F(2, 147) = 3.97, p = .02), figural originality (F(2, 147) = 3.14, p = .05), elaboration (F(2, 147) = 5.54, p = .01), and resistance to closure (F(2, 147) = 5.28, p = .01).

Post hoc testing, using the Scheffé method (see Table 10), demonstrated that statistically significant differences between the control group and the treatment groups (both traditional and cooperative groups) existed in all of the subtests for which a statistically

TABLE 8

SUMMARY OF MULTIVARIATE TESTS
FOR IMMEDIATE POSTTEST,
TTCT, FORM A

Source	Pillai's Statistic	Approximate F	df(F)	Prob (F)
Group x Originality	.449	1.466	48/870	.023*
Originality	.192	1.212	24/426	.225
Group	.446	5.054	16/282	.000*

*p < .05.

TABLE 9

SUMMARY OF MULTIVARIATE TESTS FOR DELAYED POSTTEST,
TTCT, FORM B

Source	Pillai's Statistic	Approximate F	df(F)	Prob (F)
Group x Originality	.304	0.968	48/870	.537
Originality	.254	1.643	24/426	.029*
Group	.412	4.567	16/282	.000*

*p < .05.

TABLE 10

SUMMARY OF UNIVARIATE COMPARISONS BY GROUP ON TTCT SUBTESTS FOR IMMEDIATE AND DELAYED POSTTESTS

Subtest	F-ratio	prob (F)	Scheffé Results
Form A: (immediate posttest)			
Verbal			
Fluency	7.42	.00*	Trad,Coop>Control
Flexibility	5.42	.01*	Trad,Coop>Control
Originality	11.00	.00*	Trad,Coop>Control
Figural			
Fluency	0.12	.89	
Originality	0.39	.68	
Abstractness of Title	1.76	.18	
Elaboration	19.68	.00*	Coop>Trad>Control
Resistance to Premature Closure	0.06	.94	
Form B: (delayed posttest)			
Verbal			
Fluency	2.67	.07	
Flexibility	3.67	.03*	Trad,Coop>Control
Originality	3.97	.02*	Trad,Coop>Control

TABLE 10 (continued)

Subtest	F-ratio	prob (F)	Scheffé Results
Figural			
Fluency	0.40	.67	
Originality	3.14	.05*	Trad,Coop>Control
Abstractness of Title	1.11	.33	
Elaboration	5.54	.01*	Trad,Coop>Control
Resistance to Premature Closure	5.28	.01*	Coop>Trad>Control

Note: df for all F ratios were 2, 147

*p < .05.

significant group effect had been obtained--on the verbal, a mean of 73.75 for the control group and a mean of 83.45 for the treatment groups. The control or nontreatment group obtained a fluency subtest mean score of 77.43, and, for the combined treatment groups, the mean score was 89.55. On the verbal flexibility subtest, the mean scores were 73.75 for the control group and 83.45 for the treatment groups. The control or nontreatment group obtained a mean score of 78.58 on the verbal originality subtest while the treatment groups' mean score was 92.93. On the statistically significant figural elaboration subtest, the control group had a mean score of 80.23 and the mean was 94.04 for the treatment groups. Overall, treatment appears to make a difference on the immediate posttest no matter what the classroom structure.

Statistically significant differences between the traditional ($\underline{M}$ = 87.48) and cooperative learning ($\underline{M}$ = 100.00) groups were obtained on the figural elaboration subtest on immediate testing (Form A). The figural resistance to premature closure subtest on delayed testing (Form B) was also found to be statistically significant. On this subtest, the traditional group received a mean score of 75.58 and the cooperative learning group received a mean score of .

TABLE 11

SUMMARY OF EFFECT SIZE (ES) FOR TREATMENT GROUP AND ORIGINALITY LEVEL COMPARISONS

IMMEDIATE POSTTEST
TTCT, FORM A

	Verbal			Figural					
	Flu	Flex	Orign	Flu	Orign	Abs T	Elab	ResCl	Average
Treatment vs. Nontreatment	0.48	0.42	0.69	0.03	0.09	0.15	1.25	-0.05	0.38
Coop Learning vs. Traditional	-0.35	-0.28	-0.30	-0.11	-0.11	0.24	0.70	-0.05	-0.03

DELAYED POSTTEST
TTCT, FORM B

	Verbal			Figural					
	Flu	Flex	Orign	Flu	Orign	Abs T	Elab	ResCl	Average
Treatment vs. Nontreatment	0.28	0.42	0.32	-0.16	-0.24	0.14	0.44	0.03	0.15
Coop Learning vs. Traditional	0.29	0.10	0.41	-0.03	-0.41	-0.16	-0.32	0.51	0.05

Note:
Flu = Fluency
Flex = Flexibility
Orig = Originality
Elab = Elaboration
Abs T = Abstractness of Title
ResCl = Resistance to Premature Closure
Aver = Average ES Across Subtests
Coop = Cooperative

figural elaboration subtest, the ES was a medium one which favored the cooperative learning group.

On the delayed posttest (Form B), the average ES across the eight subtests of the TTCT for cooperative vs. traditional groups was 0.05 (see Table 11). This difference is a negligible one that favors the cooperative group over the traditional group. The ES for cooperative vs. traditional group was 0.29 on the verbal flexibility subtest, and 0.41 on verbal originality. On the figural subtests, the ES on originality was -0.41, -0.32 on elaboration, and 0.51 on resistance to premature closure. On the statistically significant verbal subtests on the delayed posttest, the cooperative learning group had the advantage over the traditional group, the ESs being between the small and medium bounds. On the statistically significant figural subtests, the results on originality and elaboration demonstrated an advantage for the traditional group over the cooperative group. On the resistance to closure subtest, the medium effect size favored the cooperative learning group.

Discussion

The creativity training for all groups was met with enthusiasm on the part of the subjects. They seemed to enjoy taking the Onomatopoeia and Images test. The

children also expressed excitement about producing stories, pictures, and other activities without being concerned about grades.

When teams were formed, some negative feelings were expressed about who would constitute teammates. Most of the participants accepted their team assignments in good stride, though some appeared to be disgruntled. Some of the children on the teams had difficulty with conflict resolution when working on team activities. The concept of "consensus" as an alternative to voting was difficult for them to understand. Roles within the teams were established early. Children perceived as good artists by their teammates did the drawings. Children who expressed themselves well verbally were the team authors. Although ideas were shared, the opinions of those who did the actual drawings or stories prevailed. Teams did not change their spokespersons during the study although they were encouraged to do so. Whether by their own choice or because their ideas were ignored, some members of teams were not active in the team functioning. Some team members could have been characterized as being combative at times, using name calling, stomping off to complain to the experimenter, or taking a combative stance. As a result of observing the interactions within teams during the study, it is

believed that group skills must be taught prior to any study of how children function in groups. None of the authors in the review of literature indicated whether or not the children in their studies had previous experience in team learning. The children in this research had no such training. However, Johnson, Johnson, and Holubec (1987), in a book of sample lesson plans for teachers, note that children must be prepared to function within the cooperative learning structure. This is best done in a step-by-step manner, beginning with pairs of children working on traditional subject matter. When the time comes that the children become comfortable with the team concept, less traditional subject matter can be approached.

The content of the training sessions varied from day to day but was the same for traditional and cooperative learning groups.

The TTCT was administered both immediately after the training sessions and after a 60-day delay. Scores on the delayed test (Form B) were generally lower than the immediate test (Form A). This was contrary to what was predicted at the outset of this study, which was that the scores would not decline. Familiarity with the instrument and some loss in skills not practiced would account for some of these differences. The

results may have suffered from some confounding factors because of the number of students whose responses were not able to be scored, either because no answers were given or answers were given that were irrelevant. The number of no scores and the percentages were much larger on the verbal subtests on Form B than Form A (see Table 19) except on activities 3 and 4. On activity 4, there was no difference and, on activity 3, there was an increase of one no response from the immediate to the delayed posttest.

There was also a "boredom" factor involved in the test taking. When the booklets were presented for the delayed testing, an audible groan from the children accompanied the reading of the instructions. The first three activities were timed at 5 minutes each and the last three were 10 minutes in length. In order to administer the test in a standardized manner, these time limits were strictly adhered to, as was the reading of the instructions. Many of the children completed the tasks much sooner than the allotted time. Because of their age, it was difficult for these youngsters to sit quietly. They did behave admirably but the noises and disruptions common to restless, unoccupied children was a problem for those who needed more time to complete the tasks. All students completed the last three tasks

before the time and were encouraged to reread their responses to the activity and add to them if they could. Perhaps testing in smaller groups would have allowed for more explanations as to what was required of the students and also the time could be adjusted to the situation.

The definition of creativity looks at creativity as a process with skills that can be taught. However not all the literature has shown the results of training to be statistically significant. In this study, treatment group membership (and, therefore, training) accounted for statistically significant differences as did level of originality, and, on the immediate posttest, there was an interaction between group membership and level of originality. Differences between treatment groups (both traditional and cooperative learning groups) and control groups pointed out the effect of training, even after a delay of 60 days.

Verbal subtests contributed to the statistical significance ($p < .05$) of the main effect of group under both posttest occasions and of the main effect of level of originality in the delayed posttest (Form B). Rose and Lin (1984) noted that, in most of the studies concerning long-term creativity training programs that they had examined, verbal subtest scores were more

group membership), retention of skills was better for two of the three verbal subtests, verbal fluency being the only subtest on which group differences did not remain statistically significant on the delayed posttest. It is also interesting to note that over time, the cooperative learning group appears to have retained their creative verbal skills better than the traditional group. For the latter group, loss of skills appears to occur more rapidly since on the immediate posttest, their mean scores were higher than the cooperative group and on the delayed posttest their mean scores were lower (see Tables 14 and 15).

The results on the figural subtests contributed less to the significance of main effects than did the verbal subtests. The figural elaboration subtest was the subtest which was statistically significant in the comparison by group membership both on the immediate and delayed posttest occasions and in the comparison by level of originality main effect which occurred on the delayed posttest. The other subtests in the figural component of the TTCT which were statistically significant appear so only once. These were observed on the delayed posttest condition for group membership (originality and resistance to premature closure subtests) and level of originality (figural fluency

subtest). Rose and Lin (1984) noted the sparsity of statistically significant results in the figural tests in the research they investigated as opposed to the more consistent statistically significant results on the verbal subtests. Their explanation for this was that the figural subtests appear to measure an innate ability. It is believed that creativity training may create an ambiance of openness so that students feel some comfort in risk-taking in spite of the fact that innate abilities are lacking. This risk-taking is an element of fluency and originality. Resistance to premature closure, according to Torrance and Ball (1984), describes that facet of creative behavior which necessitates giving the person the latitude in which to process and reprocess information.

Feldhusen and Moon (1992) noted that in their research, when highly creative youngsters were members of heterogeneous groups, it appeared as if the kinds of motivation and attitudes necessary for creative endeavors were perceived as missing. This is contrary to what Johnson and Johnson (1987) and Slavin (1987) have found in their research. Part of the problem is in the fact that participation in this study was the first experience most of these children have had in working as teams. Although many of the males have been involved

with team sports, team learning appears to be a different dimension. This lack of practice before facing a totally new concept in material presented, i.e., material that was not graded or corrected as to style or format and where differences in responses were applauded rather than disparaged, may have affected the outcome. Nowhere in the literature reviewed on cooperative learning did authors state whether team learning was practiced prior to the learning experience. Also, all of the literature reviewed involved the more traditional subjects included in the curriculum.

When comparing the means of the cooperative earning group and the traditional group using estimated ES (see Tables 14 and 15), it is noted that, overall, the traditional group appears to have the advantage on the immediate posttest (Form A) (see Table 14) except on the figural elaboration subtest and abstractness of title subtest. As was previously noted, the results of analysis of the group by originality interaction on the abstractness of title subtest pointed out the advantage held by the cooperative learning group over the other two groups. On the delayed posttest (Form B) (see Table 15), the results were quite different. The cooperative learning group had the advantage, albeit a small one,

over the traditional group on all the verbal subtests and the figural resistance to closure subtest.

Summary

Creativity has been studied for many years. Business and industry have been at the forefront of creativity training and the use of groups in creative efforts. Cooperative learning, where heterogeneous groups or teams function as units within the classroom, has been of great interest in the field of education. No studies have been done to date on the efficacy of cooperative learning in creativity training.

Fifth-grade students in two schools in a small city in Mississippi participated in this research. Of the 159 students, 40 were in the control group receiving no training, 60 were in the traditional group and 59 in the cooperative learning group. The purpose of the research was to see whether creativity training was more effective when presented to children functioning in a traditional classroom setting or in heterogeneous learning teams. Creativity training lasting 50 minutes a day for 10 days was presented to the two treatment groups. The children in the control group did not participate in the workshop. Immediately after the training sessions were over, and then 60 days later, the Torrance Tests of Creative Thinking was administered.

Form A was given immediately after creativity training, and Form B 60 days later. Results were calculated not only in terms of statistical significance but also in terms of effect size (ES) which permits a more pragmatic view of the results.

Overall, the study showed that creativity training had a positive effect on the groups, as had been predicted. It very strongly demonstrated that measured verbal creativity was most affected by such training. Results on the verbal subtests were consistently statistically significant. However, subtests measuring figural creativity lacked that consistency of results. Except for the elaboration subtest which yielded statistically significant differences for group membership in both testing instances and for level of originality in the delayed posttest, there appeared to be no pattern for the other subtests of the figural measure. This observation is in keeping with what Rose and Lin (1984) found in their review of several studies. Rose and Lin stated that figural measures tend to measure innate features of creativity. On the verbal subtests, it appears that immediately after training the traditional group did better than the cooperative learning group. However, it appears that the effect of training stayed with the cooperative learning group

longer than with the traditionally structured group. On the figural subtests, the results were mixed.

Conclusions

The hypothesis predicted that there would be no statistically significant main effects of group membership on the TTCT subtests immediately after creativity training, after a 60-day delay, or both. It was rejected. Group membership did make a difference in all three instances of analyses (immediate, delayed, and combined posttests).

As a result of the analysis of data, it has been seen that group membership was consistently statistically significant in this study. Treatment via creativity training was effective and it was shown overall that such training does have an effect on measured creativity. It appeared that in the short run the traditional classroom is a more effective classroom structure with which to hold such a training workshop for children, but, in the long run, results become less clear. For example, it appears that groups functioning in cooperative learning teams do much better verbally long-term. When comparing the mean scores obtained on the immediate posttest (Form A) (see Table 8) and the mean scores on the delayed posttest (Form B) (see Table 9), the largest change noted was in the verbal

creativity scores obtained by students in the traditional group. There was a mean decline of 19.73 points on the verbal fluency subtest, 13.55 on verbal flexibility, and 19.60 on verbal originality for the traditional group students. When making the same comparisons for the cooperative learning group, the mean score declines over time were 6.39 points on verbal fluency, 7.01 on verbal flexibility, and 5.37 on verbal originality. The non-treatment, or control group, had comparable mean declines of 7.83 on verbal fluency, 9.15 on verbal flexibility, and 5.85 on verbal originality. Thus it appears that whatever advantages children working in a traditionally structured class may have at the outset, there is less stability in what has been gained.

The results have shown that creativity training over a long period is successful overall. However, the evidence as to whether or not cooperative learning teams are an appropriate vehicle for such training appears to be inconclusive. Results on verbal creativity subtests on the delayed posttest appear to be positive for that structure. Whether this is due to a greater mean decline over time on the part of the traditional group, the nature of the forms of the TTCT itself, or an increase in ability over the long run is not known. It

may be that the reason for the poorer showing lies in the fact that children in school usually function in a traditional setting and these children have never worked in a team format. Because such efforts at cooperative learning involve specific skills not generally taught, it is believed that this is a major factor in the overall results, not only those on the verbal subtests.

Time was an important element in the resulting conclusions of the study. The importance of group membership remained a strong influence over time. The smaller mean decline in verbal creative abilities demonstrated by the students in the cooperative learning group demonstrates the fact that verbal creativity does have some permanence.

Based on the results of this study, several recommendations for further investigation can be made.

1. It is recommended that a study replicating this one be conducted, except that the cooperative learning group be taught group performance skills prior to any creativity training. Because schools generally function in a traditional manner, an advantage which might have affected the outcome would be expected. According to the literature on cooperative learning, cooperation requires skills in interaction, consensus taking, active involvement, and conflict resolution. These, like all

other skills, must be taught and then practiced. Therefore, it is believed that, in this research, the traditional group had an advantage.

2. It is recommended that research be done comparing the differences in achievement and creativity between children taught in a traditional classroom and a cooperative learning structure when creative activities are incorporated into the traditional subject matter such as mathematics, reading, or language arts.

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